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ABSTRACT

A technology professional development project with 16 arts and sciences and education faculty members engaged in the preparation of preservice teachers served as the vehicle for pedagogical and curricular reform. The objective of the project is to change the teaching and learning of preservice teachers through the adoption and integration of instruction technology by teacher educators. The barriers and supports to meaningful and appropriate inclusion of instructional technology by faculty were identified from data collected via qualitative and quantitative methods during a single academic year at an urban, public college. Barriers included bureaucratic obstacles, cultural features of professional programs and elements indicating individual resistance to change. Components of the professional development that facilitated pedagogical and curricular reform included the use of support teams, a project bulletin, and onsite, just-in-time technology support. (Contains 15 references and 4 figures.) (Author)

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Faculty Technology Professional Development: A Pedagogical and Curricular Reform Model

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Key Words: faculty development, project-based learning, instructional technology

Abstract
A technology professional development project with sixteen arts and sciences and education faculty members engaged in the preparation of preservice teachers served as the vehicle for pedagogical and curricular reform. The objective of the project is to change the teaching and learning of preservice teachers through the adoption and integration of instruction technology by teacher educators. The barriers and supports to meaningful and appropriate inclusion of instructional technology by faculty were identified from data collected via qualitative and quantitative methods during a single academic year at an urban, public college. Barriers included bureaucratic obstacles, cultural features of professional programs and elements indicating individual resistance to change. Components of the professional development that facilitated pedagogical and curricular reform included the use of support teams, a project bulletin, and on-site, just-in-time technology support.

Background

At the start of the 21st Century the information age continues and the reliance on technology, especially digital technology is evident. From automobiles to cellular phones to PDAs to package delivery, computers are common features of contemporary life. Instant messaging, surfing the Internet and e-commerce pepper our vocabulary. Similarly, education at all levels is undergoing a transition as vast amounts of hardware, software and Internet connectivity proliferate throughout learning environments. According to the National Center for Educational Statistics in 1999, 95% of all public schools had access to the Internet, ranging from 94% of elementary schools to 98% of secondary schools.

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Bridging the digital divide

Less the statistics indicate that the technology diffusion and penetration is complete, only 62% of instructional rooms have Internet access in public schools (NCES, 1999). Approximately 54% of students have the Internet available to them on a regular basis after regular school hours, ranging from 46% of elementary students to 80% of secondary school students (FRSS 79, 2000).

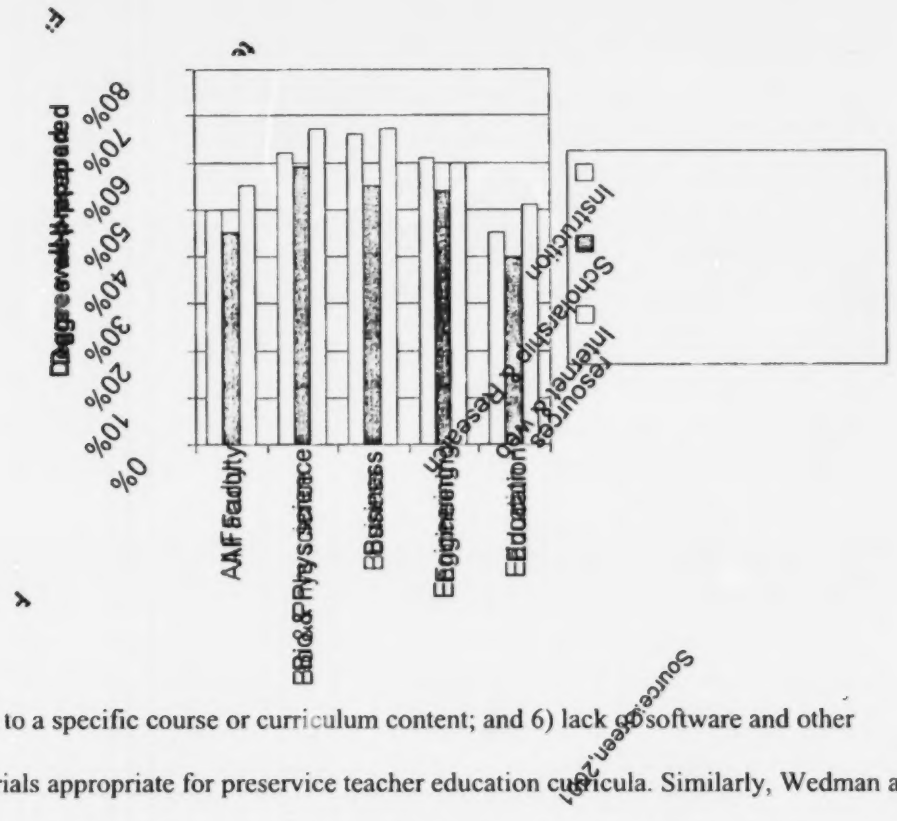
In higher education the goal of a "computer on every desk" has expanded to high-speed communication technologies, multimedia offerings, networked campuses and web-based instruction and learning. In a recent survey of higher education administrators in response to the question, "How well prepared are faculty members for using technology as a resource?", Cleary and Lee (2002) found that, on average, faculty members were better prepared for Internet and web resource uses than they were for instructional or scholarship and research uses of technology. There were differences in preparedness across the three areas among faculty in different disciplines. Unfortunately, in each instance teacher educators were below the average for all faculty (Green, 2001).

(Insert Figure 1 here)

Why is it difficult to engage teacher education faculty in the use of technology?

There can be many barriers to faculty adoption of instructional technology, including bureaucratic, cultural and psychological ones. Many identify bureaucratic or organizational factors as primary obstacles to the effective incorporation of technology in teacher education. For example, Abdal-Haqq (1995) suggests that organizational barriers are important including: 1) limited availability of hardware; 2) lack of faculty training; 3)

lack of instructional and technical support staff; 4) lack of faculty time to gain mastery in hardware and software; 5) lack of faculty time to translate technology knowledge and



skills to a specific course or curriculum content; and 6) lack of software and other materials appropriate for preservice teacher education curricula. Similarly, Wedman and Diggs (2001) suggest that technology use in teacher education is limited when performance is not the main focus. Their "performance pyramid" model identifies "tools, processes and facilities" as one of the required components for faculty modeling technology use in teaching. As a result of these barriers in teacher education, traditional instructional technology teaching is more likely to focus on learning *about* technology rather than learning *with* technology (Office of Technology Assessment, 1995).

Another challenge to technology adoption is the culture of teacher education programs. The culture may be characterized by skepticism about the utility and efficacy of new

technologies in the teaching learning process (Abdul-Haqq, 1995; Campoy, 1992). For example, in one study methods faculty utilized more traditional technology approaches in instruction like word processing, web-based student assignments, and email communication. Other technology tools, data bases and spreadsheets, which are more likely to engage higher order thinking skills and problem solving strategies, were less likely to be a part of their pedagogy (Brown, 2001). It is sometimes the case that faculty will use technology for instructional purposes to streamline instruction and assignments rather than to enhance the learning and performance processes in their teacher candidates (Blanco, 1996). Finally, the lack of clear programmatic goals for teacher education in general and technology in particular can hinder the use of instructional technology in pedagogical and curricular reform (Abdul-Haqq, 1995).

There also may be debates in teacher education about the proper placement of instruction about technology (Mehlinger & Powers, 2002). Should the knowledge and skills be developed in isolated courses with technology experts as instructors? Should infusion knowledge of technology, modeling of instructional uses and required teacher candidate performance occur across the curriculum under the supervision of diverse faculty? Or should some combination of the two extremes be available?

The presence of incentives for technology-driven pedagogical and curriculum reforms is another feature of the culture of teacher education. The incentive can include monetary compensation, released time, and inclusion in the promotion and tenure process (Lan, 2001). The use of technology in the routine administration, management and assessment activities can create a climate supporting technology adoption and integration in pedagogy. While this may not be an overt incentive, the use of technology becomes part

of the demand characteristics of carrying out normal academic business. These context factors form part of the foundation for ongoing infusion of technology in teacher education programs according to Stevens and Lonberger (1998).

The final set of barriers to technology use in teacher education is psychological and is related to resistance to change. While it is the case that in any organization a small percentage of individuals will eagerly adopt and utilize an innovation (early adopters) because of their beliefs, values and higher levels of self-confidence, the majority of organization members will take a "wait and see" attitude until there is ample evidence that adoption of the innovation is valuable (Rogers, 1986,1995). For example some faculty may become more engaged in a technology-base pedagogical and curricular reform process if they believe in constructivist modules of learning (Becker,1999). There is also evidence that educators who see themselves as instructional designers in addition to knowledge transmitters will find powerful educational applications that effectively utilize the unique characteristics of specific technology tools (Briggs 1977; Harris 2001).

Methodology

The current project, *Bridging the digital divide: Preparing today's faculty to prepare tomorrow's teachers to use technology* (Kelly, Graves, LeBlanc & Lee, 2000), is part of the PT3 initiative in which the integration of technology into curriculum and pedagogy is seen as a critical element in the transformation of teacher education from knowledge-centered to learning centered. The current project was designed to address the barriers and obstacles to effective integration of technology in teacher education programs.

Project description

Bridging the digital divide has four goals:

- Increase the effective use of technology in the teaching-learning process.
- Model the use of technology by master teachers in field experiences.
- Change curricula to require that teacher candidates demonstrate effective uses of technology.
- Enhance preservice teacher support services with technology products.

The major vehicle for pedagogical and curricular change is faculty technology professional development. The faculty technology development model is comprised of the following key components: 1) technology workshops; 2) the use of external experts; 3) a project bulletin outlining the steps to develop and implement a technology-based instructional activity; 4) individual faculty mentoring and support by a technology specialist with expertise in the multiple uses of technology; and 5) faculty technology teams (a collegial support group). This model was implemented over two semesters for the first cohort of faculty participants.

The project's technology development model uses a project-based learning approach to facilitate the instructional technology development of individual faculty. The technology project should address specific learning outcomes in teacher candidates and relate to content and technology standards for teachers and P-12 students. Each project is a technology-based, instructional activity designed for a specific course. Once implementation of the project occurs, faculty members are expected to collect data from teacher candidates about the effectiveness and utility of the project for their teaching and learning.

The technology project must include the following elements:

1. faculty modeling the use of technology in instruction

2. use of technology to enhance learning within a specific course
3. required use of technology by the preservice teachers
4. identification of applications of technology in P-12 classrooms by pre service teacher candidates
5. use of standards to guide the instructional design process
6. evaluation of the technology project by pre service teacher candidates

Subjects

Sixteen faculty members compose the first cohort in the project-based, technology development process. They include teacher educators from the School of Education who provide classes for preservice undergraduate and graduate teacher education candidates. The teacher education faculty includes members from psychological and social foundations of education, curriculum and teaching and special education. In addition, there are faculty from the School of Arts and Sciences, in particular from the Chemistry and Romance Languages departments. All are faculty who provide instruction to preservice teacher candidates in their respective departments. Finally, mentor teachers from four public schools within our partner district serve as consultants to the teacher education faculty. These educators are cooperating teachers and their schools serve as field sites for our preservice programs.

Data sources

Baseline data was collected about 1) technology knowledge and skills of faculty; 2) faculty access to computers and peripheral devices at home and in the workplace; 3) faculty use of technology for instructional and professional purposes; and 4) the penetration of the instructional technology in curricula of the faculty participants.

Evaluators collected data on the implementation of the critical components of the technology professional development process including: 1) the impact of technology workshops; 2) the utility of external experts; 3) the role of the project bulletins, which outline the steps to develop and implement a technology-based instructional activity; 4) the effectiveness of individual mentoring by a technology specialist with expertise in the multiple uses of technology; and 5) the value of faculty technology teams, a collegial support group. Self-reflective journal entries, focus groups and action research data based in the college classroom enhanced the data sources. Finally, data was collected on the identification, articulation and inclusion of content and technology standards in the technology-based projects.

Results

Baseline data document the diversity in faculty knowledge and expertise and access to appropriate technology. Over the course of the academic years, bureaucratic barriers were overcome and faculty in the project were given greater access to a range of technology facilities in their offices and in specialized classroom facilities.

Insert Figure 2 here

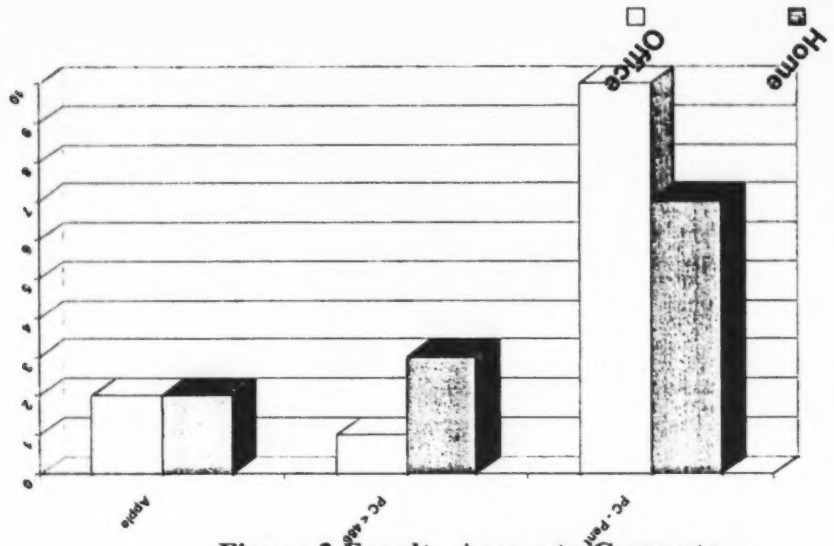
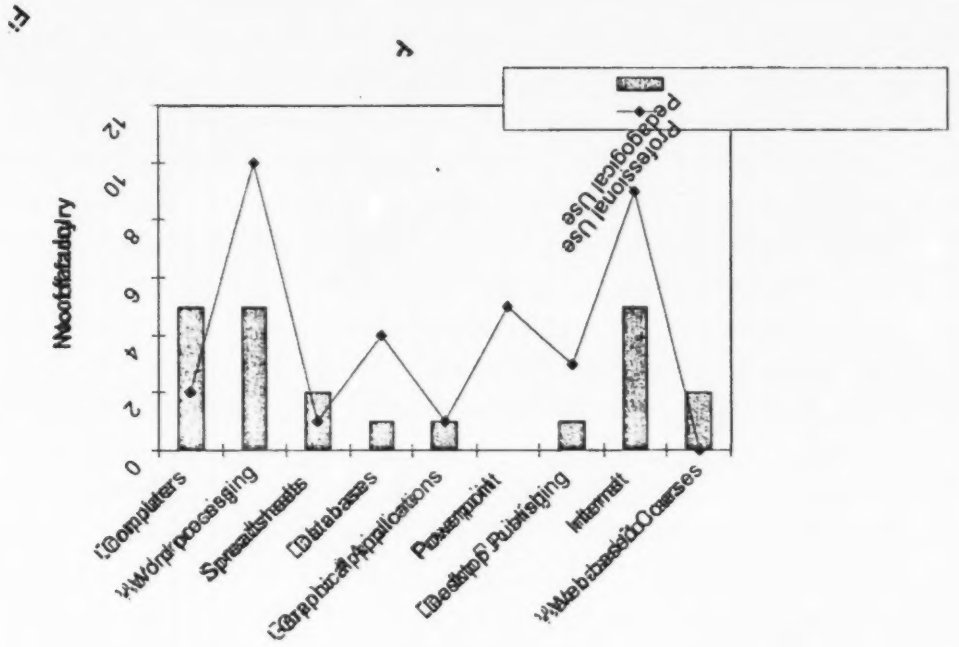


Figure 2 Faculty Access to Computers

Most faculty members used technology for professional purposes prior to the implementation of the project. However, this use was largely confined to word processing, email and for a few, Internet searching. Curricular and pedagogical analyses at baseline revealed fewer than 3 faculty members who included any instructional technology in teaching or required teacher candidates to demonstrate computer knowledge or skills. When technology was included in instruction, pedagogical uses were very limited. For example, none used PowerPoint or any other type of presentation software. Certainly the faculty was not using spreadsheets or databases that might require teacher candidates to utilize higher order thinking. The most frequent pedagogical use was the requirement that written materials from teacher candidates be word-processed.

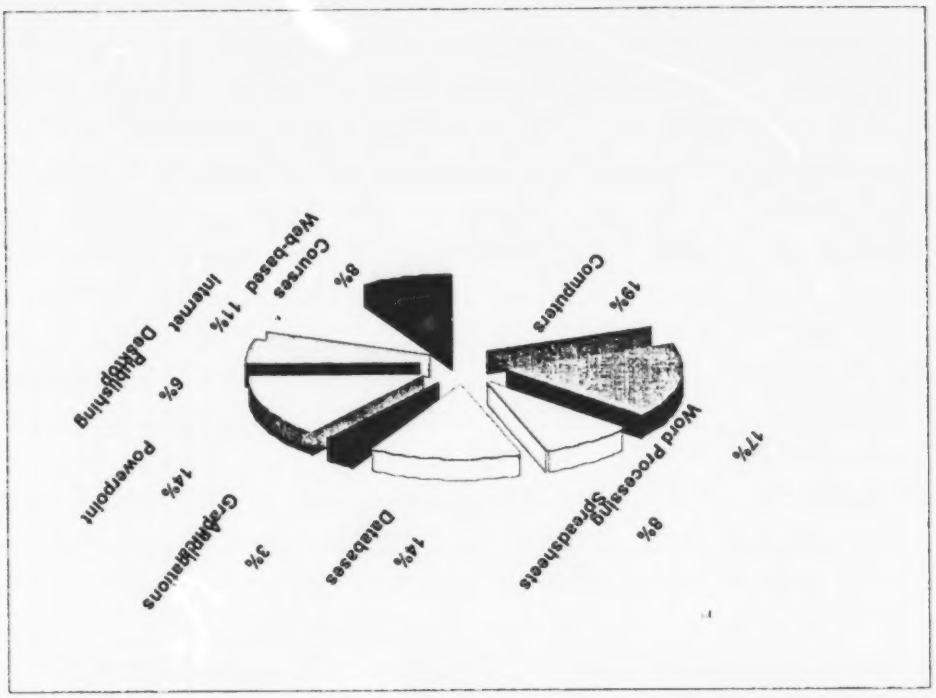
Insert Figure 3 here



After the introduction of the professional development process, the uses of technology in pedagogy changed dramatically. Almost half of the group enrolled in at least one course in the college's Blackboard course management system in addition to the PT3 training and workshops. A similar number incorporated PowerPoint for presentation purposes in their classes. The presence of faculty initiative to seek out additional technology training represented a different attitude from their prior experiences with technology training.

Insert Figure 4 here

Figure 4 Faculty Prior Technology Training



The composition of the technology team was a significant factor influencing the likelihood of adoption and integration of instructional technology into teacher education courses. In particular, technology team participation was most effective when team members shared a common area of expertise, taught similar courses and had a strong, charismatic and enthusiastic group leader. This leader served, as a catalyst for other members, helping to identify needs for additional technology training, for access to specific software and hardware and for expertise about the application of the various content and technology standards.

Another important feature leading to faculty adoption and integration of technology in instruction was the project bulletin, a curriculum and instructional design guide. The project bulletins were associated with the establishment of clear, measurable instructional

objectives by faculty members, as well as the incorporation of standards in their technology projects. Many faculty members reported that without the bulletins they would not have incorporated these standards into their instructional technology projects. Other factors were related to the different levels of impact including: initial level of technology competence; the disciplinary heterogeneity of the technology teams; availability of a technology specialist and the level of technology competence of the mentor teacher on the team. Finally, the role of incentives and external curriculum reform pressures also played an important role. The case studies will provide additional details about the interaction of factors that fostered or inhibited in the adoption and integration of instructional technology into teacher education pedagogy and curricula.

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